The HERMES - Polarized Atomic Beam Source

A. Nass (or the HERMES target group)
Physikalisches Institut der Universität Erlangen - Nürnberg, E. Rommel - Str. 1, 91058 Erlangen, Germany

The HERMES experiment is installed in the HERA electron storage ring at DESY (Hamburg) and taking polarized data since 1996. The Atomic Beam Source (ABS) is used to provide nuclear polarized hydrogen and deuterium atoms for the HERMES target. The 1016 - flow rate' of polarized hydrogen in two hyperfine substates is about $6.6 \cdot 10^{16}\ \vec{H}\ /s$ (deuterium in three hyperfine substates $4.5 \cdot 10^{16}\ \vec{D}/s$). The degree of dissociation of 92% for H (95% for D) at the entrance of the storage cell and the nuclear polarization of around 0.97 (H) and 0.92 (D) have been found constant within a few percent over the whole running period of the HERMES experiment. A new dissociator (MVM) based on a microwave discharge at 2.45 GHz has been developed[2] and installed into the HERMES-ABS in 2000. The long-term stability of the deuterium intensity was found to be improved compared to the Radio-Frequency Dissociator (RFD) used so far with an intensity gain of 15%. Further developments on a liquid cooled MWD are in progress in order to outperform the water-cooled RFD. Since the velocity distribution of the microwave based dissociator differs from that of the RFD the intensity could be increased further with a modified sextupole magnet system. For this purpose the way for a new start generator for sextupole Monte-Carlo simulations was opened. Monte-Carlo simulations[3] were successfully used to describe the gas expansion between nozzle, skimmer and collimator. In addition a new type of beam monitor[4] was used to study the beam formation after the nozzle. There was a good agreement between the measured intensity profiles and the predictions by the Monte-Carlo calculations for the beam formation.

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F,mail: alexander.nass@desy.de
Phone: (+49) 40-8998 4682
Fax: (+49) 40-8998 4034